AbstractID: 13736 Title: Anterior fields improve rectal sparing in prostate treatment by proton therapy

Purpose: Current proton prostate treatments use only lateral beams, relying solely on the lateral beam penumbra for rectal sparing, rather than the much sharper distal penumbra. In this work, we perform a treatment planning study to demonstrate the potential dosimetric benefits of anterior fields for patients treated with a rectal water balloon and also to explore the corresponding requirements for the accuracy of beam range verification/correction.

Method and Materials: The study was conducted using the Xio treatment planning system (Elekta). Ten prostate patients who used endorectal water balloons during their treatments were selected. Each patient was first planned with bi-lateral beams following the conventional treatment protocol. Then straight anterior and bi-oblique (+/- 30 degree) anterior fields were planned, with the range compensators initially generated based on the water equivalent path length (WEPL) to the distal surface of prostate, and then manually adjusted to improve the dose conformality. The dose volume distributions were compared between three treatment plans, a) equally weighted bi-lateral beams, b) a single anterior beam, and c) equally weighted bi-oblique anterior beams.

Results: The anterior proton beams require less beam energy, ~10 cm WEPL less than that of lateral beams. The average values of $V_{95\%}$,$V_{80\%}$,$V_{50\%}$ for anterior rectum wall are 39%,58%,74% for plan a, 8%,27%,49% for plan b, and 6%,26%,51% for plan c. The $V_{95\%}$,$V_{80\%}$,$V_{50\%}$ for the bladder are 6%,12%,18% for plan a, 14%,31%,39% for plan b, and 8%,16%,25% for plan c. The femoral heads receive ~40% of the prescribed dose in the bi-lateral beams, but nearly none in the anterior beams.

Conclusion: Compared with the bilateral beams, treatment of prostate with anterior and/or oblique anterior beams offers significant improvement in sparing the anterior rectal wall. The femoral heads are free of radiation at the cost of a moderate increase in bladder dose.